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Transport Problems Associated With Reactivating the
North Vietnamese Surface-to-Air Missile SystemSummary and Conclusions

There does not appear to be any combination of bombing of both the missile sites and the surface transport network in North Vietnam which would preclude the reactivation of the existing surface-to-air missile system in North Vietnam. By resorting to alternative means of transport -- particularly road transport, and, if necessary, combined sea and inland water transport -- the 8 missile sites in North Vietnam could be reactivated within a month after destruction by bombing. If the system is expanded to include 12 sites, the delay could be as much as 5 or 6 weeks.

If the rail transport facilities were not damaged shipment by rail from the Chinese border at P'ing-hsiang to Hanoi of 2 missile regiments required for 8 sites would take about 5 days. Movement of the missile regiments from the USSR across China to the border of North Vietnam would take at least 2 weeks so that at least 3 weeks would elapse before missiles would again be in place at the bombed out sites. Necessary reconstruction and repair at each site could also be accomplished within this period.

If the North Vietnamese rail system were simultaneously interdicted the 2 missile regiments could be moved on their own organic transportation on the main road from P'ing-hsiang to Hanoi in from 5 to 10 days, thus adding no more than a week to the length of time necessary to make the launch sites operational. Even if the railroad bridges and the combined road and rail bridges on the rail line and on the main road were severely damaged motor transport could still be used to move the missiles and associated equipment. This could be accomplished by the temporary repair of bridges and by the use of ferries and fords wherever necessary.

If intensive aerial attacks were successful in practically eliminating rail and road transport in North Vietnam, the 2 missile regiments could be

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transported by sea to Haiphong. The sea voyages could originate from Black Sea ports or from Vladivostok, or from the Chinese port of Changhai. From Haiphong the equipment could be moved by barge on the inland waterway system to the Hanoi area. A movement of this type would require 4 standard-sized merchant ships and numerous boats and barges which are in ample supply in the Hanoi-Haiphong area. The total time elapsed for such a movement should not exceed one month in spite of the long distances and transloading operations involved.

I. Introduction

This study analyzes the problems involved in transporting equipment for the reactivation of the surface-to-air missile (SAM) system in North Vietnam if existing installations are completely destroyed and transport routes are interdicted. It is assumed that all existing launch sites, including missiles and associated equipment, are destroyed and that support facilities and equipment are also destroyed.

II. The SAM System in North Vietnam

Currently there are 8 identified SA-2 launch sites in North Vietnam,

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The five sites located around Hanoi are completed and probably are operational. The other three sites are located somewhat further from Hanoi -- about 52 to 56 kilometers to the northwest. The total weight of missiles and equipment for one permanently deployed SA-2 site (one SAM battalion) is about 500 to 550 tons.* It is believed that the Soviet Union plans to deploy equipment for at least 2 SAM regiments or 8 SAM launch sites and possibly as many as 3 SAM regiments (12 sites) in North Vietnam. The weight of missiles and other equipment for a total of 8 launch sites conducting sustained operations, therefore, would be 4,000 to 4,400 tons and for 12 sites would be 6,000 to 6,600 tons. In addition to the missiles and equipment required for each launch site,

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* The total weight of the minimum amount of equipment for one SA-2 launch site which cannot conduct sustained operations is about 360 to 410 tons. For a launch site which is permanently deployed, more equipment (missiles and missile transporters) would be required. For a list of equipment, see the Table, p. 7, below.

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Tonnages are given in metric tons throughout this memorandum.

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The total weight of missiles and other equipment for 2 regiments including their support facilities is about 6,500 tons and for 3 regiments is about 9,700 tons.

III. Transportation of the SAM System

The missiles and other equipment for the SAM sites presently in North Vietnam are believed to have been transported by rail from the Soviet Union through China and on to Hanoi on the Dong Dang - Hanoi railroad. Although it is possible that this equipment could have been transported by ship to Haiphong, a thorough analysis of merchant shipping from the Soviet Union does not reveal that such shipments were made and it is doubtful that this means of transportation was used.

The SA-2 system is road mobile and the equipment can be transported on unimproved roads. The bulky nature of some of the equipment and the low speed of the tracked prime movers (10 kilometers per hour), however, limit the mobility of the system. The dimensions and weights of some of the equipment are shown in the following tabulation:

<u>Equipment</u>	<u>Length (in feet)</u>	<u>Width (in feet)</u>	<u>Height (in feet)</u>	<u>Weight (in pounds)</u>
Launcher	32.8	8.7	8	25,794
Generator Van	22.8	8.5	10.6	19,841
Radar Van	17.6	8	11.6	29,762
Transporter	33.5	7.6	7.3	11,152
Oxidizer Transporter	26.8	7.2	9.1	6,217

Because of the weight and size of some of the critical pieces of equipment, it appears almost impossible to airlift the equipment for an entire SA-2 regiment. The overall weight of the missiles and other equipment for the regiment would require at least 240 sorties by the AN-12, a general cargo plane with an average capacity of 25,000 pounds. Furthermore, the

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dimensions of the AN-12, which has a maximum cargo door width of 9.7 feet and height of 8.5 feet, would make it very difficult if not impossible to load some of the larger pieces of equipment, although with alterations of the equipment (such as removing wheels) or alterations of the planes, some of the larger pieces could be loaded. It is possible, however, that some of the smaller pieces of equipment, spare parts, and personnel would be transported by air.

An estimated 400 freight cars or 20 trains would be required to transport the missiles and other equipment for one SA-2 regiment from China to Hanoi on the Dong Dang - Hanoi railroad line. The requirements for 8 launch sites and their support facilities, therefore, would be about 40 trains. It would probably take about 5 days to move this number of trains over the Dong Dang - Hanoi line if other incoming rail traffic from China were excluded.

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IV. Transportation of SAMs on Bombed Transport Routes

A. The Dong Dang - Hanoi Routes

The main transport routes from the Chinese border to Hanoi are the Dong Dang - Hanoi railroad line and highway route 1A, which runs generally parallel to the rail line. There are 14 large bridges on these two routes and numerous small bridges. Of the 14 large bridges, 7 are rail only, one is road only, and 6 are combination rail and road bridges -- destruction of which would, of course, hinder both rail and road traffic. The length of these bridges ranges from about 70 to 950 feet except for the Doumer Bridge at Hanoi which is about 8,500 feet in length. In addition to the rail line and route 1A, there are alternate, though more circuitous, road systems linking China with Hanoi through Mong Cai and Cao Bang.

If existing SAM launch sites and support facilities, including missiles and other equipment, were destroyed, SA-2 equipment for new sites probably could be delivered over the Dong Dang - Hanoi transport routes even if all rail and road bridges were severely damaged.* This would be

* At least one span dropped.

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accomplished by the use of ferries and fords wherever possible and the temporary repair of bridges if the by-passing of severely damaged bridges were not feasible. Truck transportation probably would be used rather than rail transportation because a rail shuttle operation between bombed bridges would involve greater difficulty in off-loading and reloading the equipment. Trucks can either ford or be ferried across most of the rivers and, where this is not feasible, the temporary repair of bridges for truck service would take less time than it would for rail service. Trains conducting a shuttle service also could be more easily interdicted by aircraft than could trucks.

At least 800 vehicles would be involved in moving two SA-2 regiments from the Chinese border to Hanoi. Since almost all of these vehicles are organic to an SA-2 regiment few trucks would be needed from the North Vietnamese truck park. Two SA-2 regiments could be moved by truck from P'ing-hsiang, China, to Hanoi (a distance of about 180 kilometers) in about 5 to 10 days if there were no delay in constructing ferries or making temporary repairs to the bombed bridges.* Transportation of the 2 regiments from the Soviet Union across China to the transloading station at P'ing-hsiang would take at least 2 weeks so that the missiles and other equipment could arrive in the Hanoi area within one month.

Ferrying facilities for trucks are available at the four river crossings closest to Hanoi and could quickly be developed at many of the other crossings between Kep and Lang Son. Terrain conditions are generally favorable for the establishment of ferry crossings where necessary. Temporary repair of bridges for the use of trucks carrying SA-2 equipment could generally be completed within 3 weeks. About 2 to 3 weeks would be needed to install timber trestles and deck sections for the temporary repair of the large bridges. Temporary repair of medium-sized bridges (70 to 150 feet) would require about 6 to 7 days. Small bridges could be restored within 24 hours by converting them to culverts.** If intensive and continued aerial attacks severely curtailed ferrying operations, repair work on bridges, and truck movements on route 1A, the alternate road systems through Mong Cai and Cao Bang could be used, although this would involve a considerable increase in the distance of movement.

* The speed of travel would be limited by night movement, the speed of the tracked prime movers (an average of about 10 kilometers per hour), and the capacity of the road.

** Culverts in this context are defined as metal pipes, or concrete or timber structures whose capacity would accommodate the stream flows under average weather conditions, but would not be large enough to carry flood waters. These would ordinarily be placed or constructed in the stream bed and the rest of the area would be filled to grade with earth and stones. Flood waters also would hamper ferry operations in by-passing severely damaged bridges.

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B. Haiphong-Hanoi Routes

The Soviet Union might be hesitant to transport SA-2 missiles and other equipment by sea because of the risk involved in possible quarantine measures taken by the US. If sea transportation were used, however, shipments from Vladivostok would be unloaded at Haiphong and would take about 5 to 6 days. From Nikolayev, on the Black Sea, the voyage to Haiphong would take about 10 days. It also is possible that the equipment could be transported by rail from the Soviet Union across China to Chan-chiang (Fort Eoyard) or Whampoa (Canton) and then move by sea to Haiphong. The equipment normally would then be moved on either the Haiphong-Hanoi railroad line or a relatively high-capacity road between the two cities. As an alternative means of transportation, a well-developed inland water system exists between Haiphong and Hanoi. If intensive and continued aerial attacks were successful in severely curtailing the transportation of missiles and other equipment by rail and road, they could be moved on the inland waterways. Sufficient numbers of open barges capable of carrying the larger equipment have been observed in the Hanoi-Haiphong area. There is an ample supply of boats and barges to carry the total amount of missiles and other equipment required to reactivate the SA-2 system.

It is believed that interdiction of the inland water routes between Haiphong and Hanoi would be extremely difficult, if not impossible, to achieve. Aerial attacks on barges, however, would undoubtedly increase the risk and time involved in moving the equipment to Hanoi. The trip from Haiphong to Hanoi by boat normally takes at least 2 to 3 days. If barges and boats were required to move only at night and hide by day, this time probably would be at least doubled and perhaps tripled. The total time elapsed for the movement of two SA-2 regiments from the Soviet Union to the Hanoi area might possibly be a month because of the distance and the various transloading operations involved. Necessary reconstruction and repair at each site also could be achieved within this period.

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Table

Major Equipment Associated With
One SA-2 Launch Site

<u>Type of Equipment</u>	<u>Quantity</u>	
	<u>Minimum a/</u>	<u>Table of Equipment b/</u>
SA-2 missiles	6	12
Missile transporters	6	7
Launchers	6	6
Radar vans (Pan Song)	6	6
Radar trucks (Spoonrest and IFF)	2	2
Generator vans	3	3
Communications van (Mercury Grass)	1	1
Power distribution van	1	1
Tracked prime movers	10	10
Trucks (ZIL 151/157)	10	10
Single-axle generator	1	1
Cable equipment and cable laying vehicle	1	1

- a. Equipment for an SA-2 Battalion which will not conduct sustained operations.
b. Authorized equipment for an operational unit.

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